

**SAVEETHA SCHOOL OF ENGINEERING**

**SAVEETHA INSTITUTE OF MEDICAL AND TECHNICAL SCIENCES**

# CAPSTONE PROJECT REPORT

**PROJECT TITLE**

RESTAURANT RESERVATION SYSTEM WITH JAVA AND MYSQL

# REPORT SUBMITTED BY

SHAIK NAYAZ IRFAN ALI - 192211326

**REPORT SUBMITTED TO**

Dr. S. PADMAKALA

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CSA0908 - PROGRAMMING IN JAVA WITH AWT

SLOT A

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**ABSTRACT:**

The CRUD Operations Java program demonstrates basic CRUD (Create, Read, Update, Delete) operations on a MySQL database, tailored for a restaurant reservation system. It uses JDBC to connect to the database and perform operations on a reservations table. The program begins by establishing a connection to the database and providing a menu for the user to choose from various CRUD operations.

For the Create operation, the program prompts the user to enter details like reservation ID, customer name, date, time, and number of guests, which are then inserted into the reservations table. The Read operation retrieves and displays all reservation records. The Update operation allows the user to update reservation details, such as date or time, based on the reservation ID. Finally, the Delete operation enables the user to cancel a reservation using the reservation ID.

Error handling is included to manage exceptions related to JDBC driver loading and SQL operations. The program utilizes PreparedStatement for insert, update, and delete operations to prevent SQL injection and improve performance.

**INTRODUCTION:**

The CRUD Operations Java program is designed to interact with a MySQL database, performing fundamental database operations for a restaurant reservation system. It demonstrates the implementation of CRUD (Create, Read, Update, Delete) functionalities using Java's JDBC API. This program serves as a practical example of how Java applications can efficiently manage reservation records in a restaurant setting.

The program begins by establishing a connection to the MySQL database, where the JDBC driver is loaded and Driver Manager is used to connect to the specified database. Connection details like URL, username, and password are provided within the program. Upon a successful connection, the program presents a menu-driven interface, allowing users to select and perform various database operations.

For the Create operation, the program prompts the user to input details such as reservation ID, customer name, date, time, and number of guests. These details are inserted into the reservations table using a Prepared Statement. The Read operation fetches and displays all current reservation records, giving a comprehensive view of all bookings in the system.

The Update operation allows users to modify reservation details, such as the date or time, based on the reservation ID. Similarly, the Delete operation lets users cancel a reservation by providing the reservation ID. All operations use Prepared Statement to improve security and prevent SQL injection attacks.

Throughout the program, appropriate error handling mechanisms are implemented to manage exceptions related to JDBC driver loading and SQL operations. This ensures that the program functions smoothly and provides useful feedback to users in case of errors. Overall, the CRUD Operations program serves as a robust example of database interaction in Java, demonstrating essential techniques for managing reservation records in a restaurant.

**LITERATURE REVIEW:**

In the context of restaurant reservation systems and application development, numerous studies and resources have underscored the significance of implementing efficient CRUD (Create, Read, Update, Delete) operations. These operations are fundamental to any database-driven application, ensuring data integrity, accessibility, and usability. The literature offers extensive insights into best practices, performance optimization, and security measures associated with CRUD operations in restaurant reservation systems.

Best Practices for CRUD Operations: The literature emphasizes the importance of using prepared statements over direct SQL queries to mitigate SQL injection attacks, a common vulnerability in database applications. Works like "SQL Injection Attacks and Defense" by Justin Clarke highlight how prepared statements and parameterized queries provide a secure method for handling user inputs in SQL operations. In a restaurant reservation system, where user data like customer details, reservation times, and guest numbers are stored, these practices are critical to ensure data security. Furthermore, following the Single Responsibility Principle (SRP) in software design, as discussed in Robert C. Martin's "Clean Code," aids in maintaining a clear separation of concerns, making CRUD operations for reservations more manageable and less error-prone.

Performance Optimization: Efficient data retrieval and manipulation are crucial for the performance of database applications, particularly in a high-demand setting like restaurant reservations. Research on indexing strategies, as explored in "Database System Concepts" by Silberschatz, Korth, and Sudarshan, highlights the importance of using indexes to optimize query execution for read operations, such as fetching available reservation slots or customer booking histories. Moreover, batch processing techniques for bulk insert, update, and delete operations can significantly reduce the overhead associated with multiple database interactions, which is particularly useful for handling peak reservation times or cancellations in a restaurant reservation system.

Transaction Management: Ensuring data consistency and integrity during CRUD operations is vital, especially when handling restaurant reservations where overbooking or double-booking must be avoided. The ACID (Atomicity, Consistency, Isolation, Durability) properties, as described in "Transaction Processing: Concepts and Techniques" by Jim Gray and Andreas Reuter, provide a framework for managing transactions in a reliable manner. For instance, in a restaurant reservation system, ACID-compliant transaction management ensures that reservations are either fully completed or rolled back in case of system failures, preventing data inconsistencies or incomplete bookings.

Case Studies and Applications: Practical implementations and case studies, such as those found in "Pro JPA 2 in Java EE 8" by Mike Keith and Merrick Schincariol, illustrate the application of CRUD operations in large-scale, enterprise environments. These resources provide real-world examples of how CRUD functionalities are employed in complex systems, such as restaurant chains or online reservation platforms. Emphasis is placed on the importance of scalability and maintainability in CRUD design, ensuring that restaurant reservation systems can handle a growing customer base and increasing demand without sacrificing performance or data integrity.

### **Expected Outcomes:**

**Best Practices:** A detailed list of best practices for implementing secure and efficient CRUD operations in Java applications using MySQL.

**Performance Insights:** Understanding of the impact of various optimization techniques on CRUD operation performance.

**Security Recommendations:** Strategies to mitigate common security vulnerabilities in CRUD operations.

**Case Study Learnings:** Insights from real-world implementations to inform and improve future application development.

**Comprehensive Report:** A well-documented report summarizing the research findings, methodologies, and recommendations.

**JAVA CODE:**

import java.sql.Connection;

import java.sql.DriverManager;

import java.sql.SQLException;

import java.sql.Statement;

import java.sql.ResultSet;

import java.util.Scanner;

public class RestaurantReservationSystem {

private static final String url = "jdbc:mysql://localhost:3306/Restaurant\_db";

private static final String username = "root";

private static final String password = "0077";

public static void main(String[] args) throws ClassNotFoundException, SQLException {

try {

Class.forName("com.mysql.cj.jdbc.Driver");

} catch (ClassNotFoundException e) {

System.out.println(e.getMessage());

}

try {

Connection connection = DriverManager.getConnection(url, username, password);

while (true) {

System.out.println();

System.out.println("Restaurant RESERVATION SYSTEM");

Scanner scanner = new Scanner(System.in);

System.out.println("Choose an operation:");

System.out.println("1. INSERT (Reserve a table)");

System.out.println("2. DELETE (Delete reservation)");

System.out.println("3. SELECT (View reservations)");

System.out.println("4. UPDATE (Update reservation)");

System.out.println("5. EXIT");

System.out.print("Choose an option: ");

int choice = scanner.nextInt();

switch (choice) {

case 1:

reserveRoom(connection, scanner);

break;

case 2:

deleteReservation(connection, scanner);

break;

case 3:

viewReservations(connection);

break;

case 4:

updateReservation(connection, scanner);

break;

case 5:

exit();

scanner.close();

return;

default:

System.out.println("Invalid choice. Try again.");

}

}

} catch (SQLException e) {

System.out.println(e.getMessage());

} catch (InterruptedException e) {

throw new RuntimeException(e);

}

}

private static void reserveRoom(Connection connection, Scanner scanner) {

try {

System.out.print("Enter Customer name: ");

String guestName = scanner.next();

scanner.nextLine(); // consume newline

System.out.print("Enter table number: ");

int roomNumber = scanner.nextInt();

System.out.print("Enter contact number: ");

String contactNumber = scanner.next();

String sql = "INSERT INTO reservations (guest\_name, room\_number, contact\_number) " +

"VALUES ('" + guestName + "', " + roomNumber + ", '" + contactNumber + "')";

try (Statement statement = connection.createStatement()) {

int affectedRows = statement.executeUpdate(sql);

if (affectedRows > 0) {

System.out.println("Reservation successful!");

} else {

System.out.println("Reservation failed.");

}

}

} catch (SQLException e) {

e.printStackTrace();

}

}

private static void deleteReservation(Connection connection, Scanner scanner) {

try {

System.out.print("Enter reservation ID to delete: ");

int reservationId = scanner.nextInt();

if (!reservationExists(connection, reservationId)) {

System.out.println("Reservation not found for the given ID.");

return;

}

String sql = "DELETE FROM reservations WHERE reservation\_id = " + reservationId;

try (Statement statement = connection.createStatement()) {

int affectedRows = statement.executeUpdate(sql);

if (affectedRows > 0) {

System.out.println("Reservation deleted successfully!");

} else {

System.out.println("Reservation deletion failed.");

}

}

} catch (SQLException e) {

e.printStackTrace();

}

}

private static void viewReservations(Connection connection) throws SQLException {

String sql = "SELECT reservation\_id, guest\_name, room\_number, contact\_number, reservation\_date FROM reservations";

try (Statement statement = connection.createStatement();

ResultSet resultSet = statement.executeQuery(sql)) {

System.out.println("Current Reservations:");

System.out.println("+----------------+-----------------+---------------+----------------------+-------------------------+");

System.out.println("| Reservation ID | Guest | Room Number | Contact Number | Reservation Date |");

System.out.println("+----------------+-----------------+---------------+----------------------+-------------------------+");

while (resultSet.next()) {

int reservationId = resultSet.getInt("reservation\_id");

String guestName = resultSet.getString("guest\_name");

int roomNumber = resultSet.getInt("room\_number");

String contactNumber = resultSet.getString("contact\_number");

String reservationDate = resultSet.getTimestamp("reservation\_date").toString();

System.out.printf("| %-14d | %-15s | %-13d | %-20s | %-19s |\n",

reservationId, guestName, roomNumber, contactNumber, reservationDate);

}

System.out.println("+----------------+-----------------+---------------+----------------------+-------------------------+");

}

}

private static void updateReservation(Connection connection, Scanner scanner) {

try {

System.out.print("Enter reservation ID to update: ");

int reservationId = scanner.nextInt();

scanner.nextLine(); // consume newline

if (!reservationExists(connection, reservationId)) {

System.out.println("Reservation not found for the given ID.");

return;

}

System.out.print("Enter new Customer name: ");

String newGuestName = scanner.nextLine();

System.out.print("Enter new table number: ");

int newRoomNumber = scanner.nextInt();

System.out.print("Enter new contact number: ");

String newContactNumber = scanner.next();

String sql = "UPDATE reservations SET guest\_name = '" + newGuestName + "', " +

"room\_number = " + newRoomNumber + ", " +

"contact\_number = '" + newContactNumber + "' " +

"WHERE reservation\_id = " + reservationId;

try (Statement statement = connection.createStatement()) {

int affectedRows = statement.executeUpdate(sql);

if (affectedRows > 0) {

System.out.println("Reservation updated successfully!");

} else {

System.out.println("Reservation update failed.");

}

}

} catch (SQLException e) {

e.printStackTrace();

}

}

private static boolean reservationExists(Connection connection, int reservationId) {

try {

String sql = "SELECT reservation\_id FROM reservations WHERE reservation\_id = " + reservationId;

try (Statement statement = connection.createStatement();

ResultSet resultSet = statement.executeQuery(sql)) {

return resultSet.next(); // If there's a result, the reservation exists

}

} catch (SQLException e) {

e.printStackTrace();

return false; // Handle database errors as needed

}

}

public static void exit() throws InterruptedException {

System.out.print("Exiting System");

int i = 5;

while (i != 0) {

System.out.print(".");

Thread.sleep(1000);

i--;

}

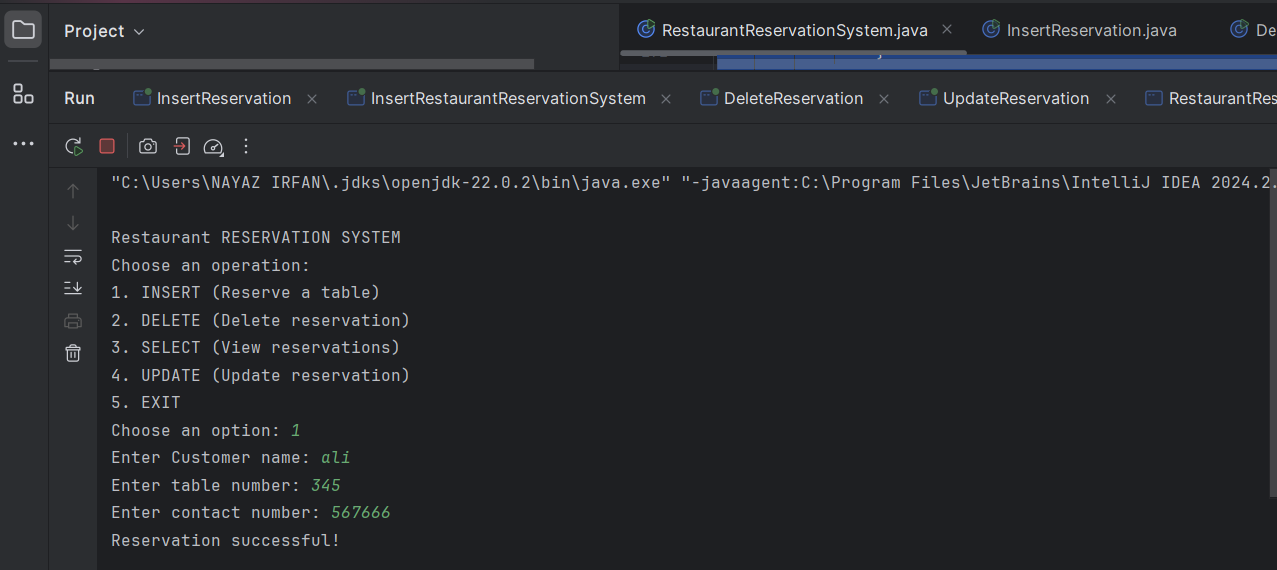
System.out.println();

System.out.println("Thank you for using the Restaurant Reservation System!");

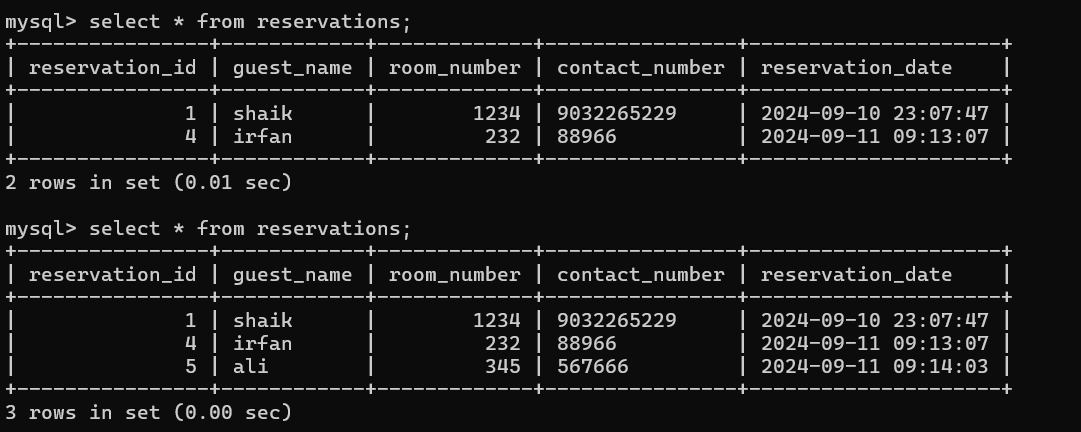
}

}

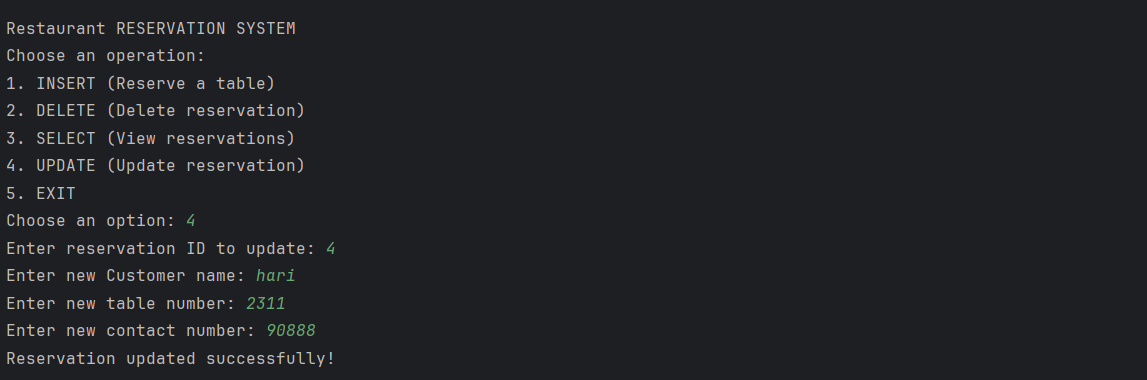
**INPUT: TO INSERT**

****

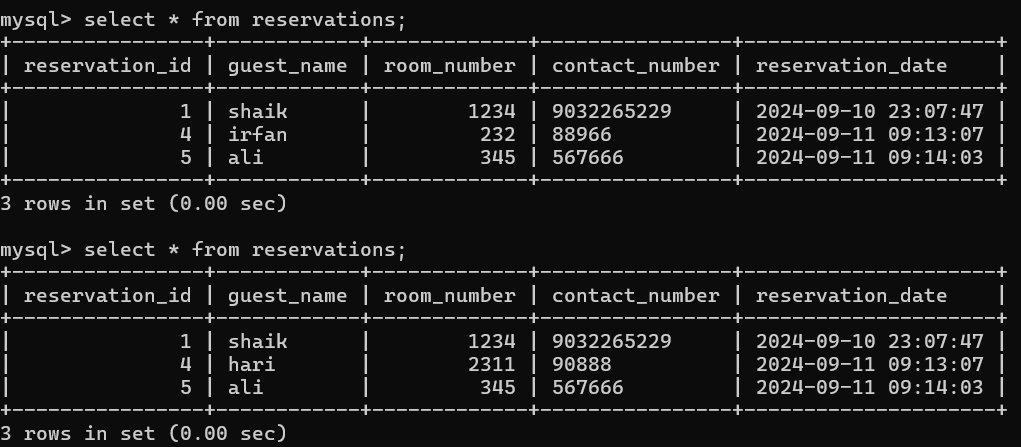
**OUTPUT:**

****

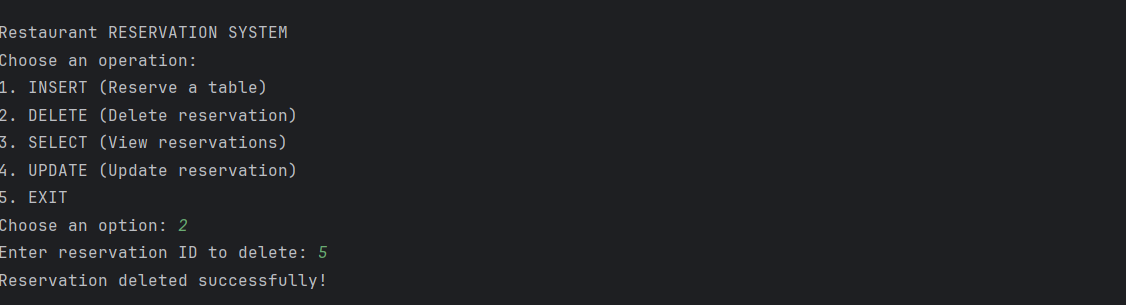
**INPUT: TO UPDATE**

****

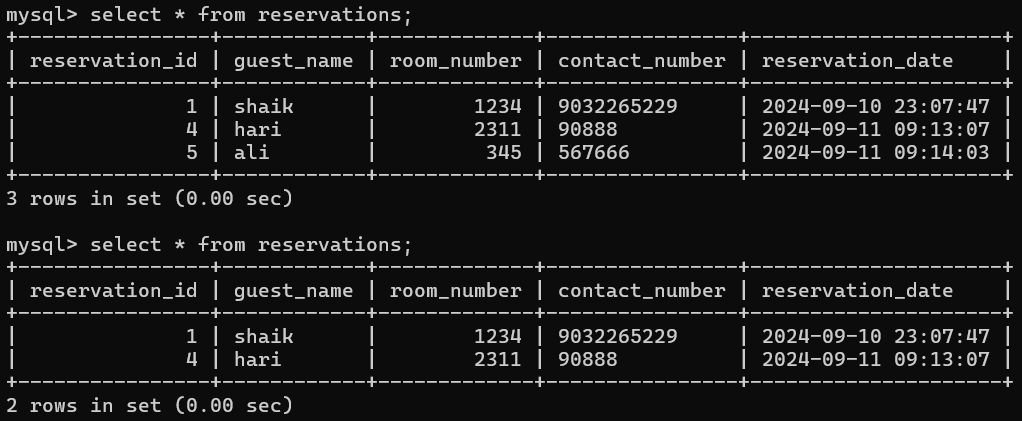
**OUTPUT:**

****

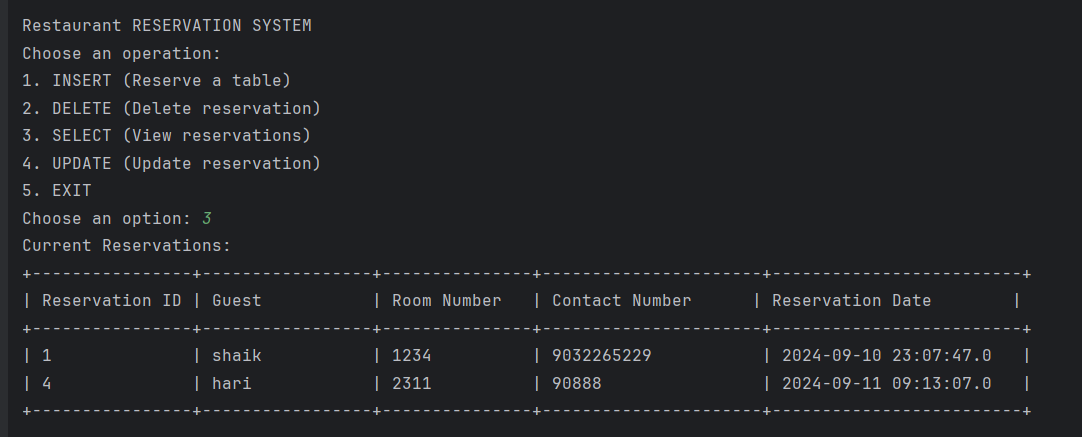
**INPUT: TO DELETE**

****

**OUTPUT:**

****

**OUTPUT: TO SELECT**

****

**CONCLUSION:**

In conclusion, the exploration of CRUD operations within Java applications using MySQL reveals essential principles and practices critical to effective restaurant reservation management and application development. Through this study, valuable insights have been gathered from various sources, emphasizing best practices, performance optimization strategies, transaction management principles, and security measures specifically tailored for restaurant reservation systems.

Best Practices: The use of prepared statements and parameterized queries emerges as a crucial approach to safeguard against SQL injection attacks. By separating user input from SQL commands, restaurant reservation systems can enhance security and maintain data integrity, ensuring that sensitive information such as customer names, reservation times, and guest counts are handled securely.

Performance Optimization: Techniques like indexing and batch processing play pivotal roles in optimizing CRUD operations for reservation systems. These methods not only improve query execution times (e.g., fetching available time slots or updating multiple reservations) but also contribute to overall application efficiency and scalability, especially during peak reservation times.

Transaction Management: Adhering to ACID (Atomicity, Consistency, Isolation, Durability) properties ensures reliable transaction management in restaurant reservation systems. By following these principles, the system guarantees data integrity across complex operations, such as booking modifications or cancellations, preventing overbooking or incomplete reservations.

Security Measures: Implementing robust security measures, including input validation and access control mechanisms, mitigates vulnerabilities inherent in CRUD operations. These practices are critical for protecting against unauthorized access and ensuring that only valid reservation data is processed.

In synthesizing these elements, it becomes evident that effective CRUD operations are integral to maintaining robust, scalable, and secure restaurant reservation systems. By applying these principles, developers can enhance application reliability, performance, and security while ensuring the integrity of critical reservation data. As technology evolves, future research and the integration of emerging technologies will continue to refine these practices, further optimizing CRUD operations in the context of restaurant reservation system development.

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